

PHILLIPS

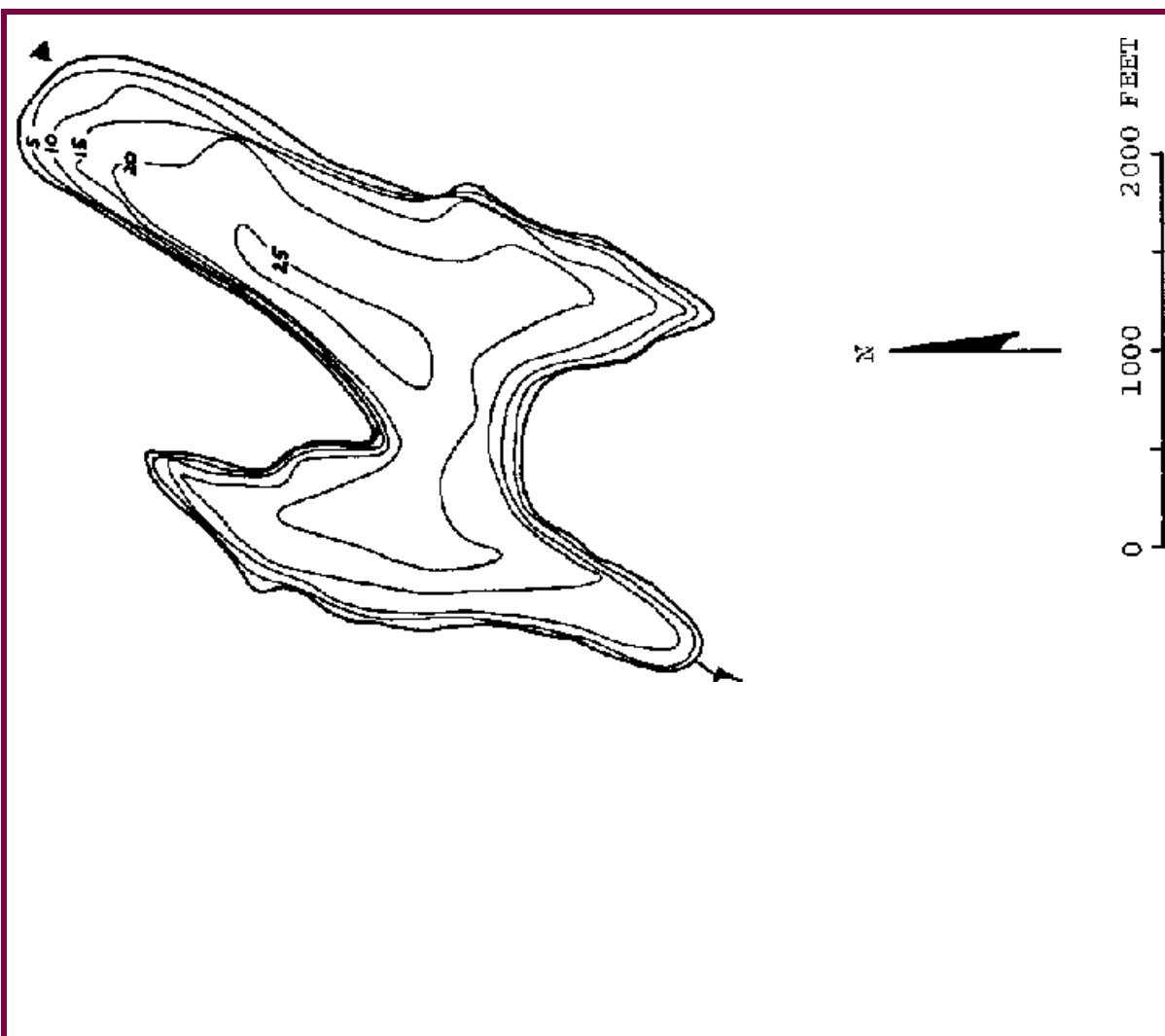
MASON County

Lake ID: PHIMA1

Ecoregion: 2

Phillips Lake is located seven miles north of Shelton. It has no surface inlets, and drains via Campbell Creek through a marshy area to Oakland Bay.

| <i>Area (acres)</i> | <i>Maximum Depth (ft)</i> | <i>Mean Depth (ft)</i> | <i>Drainage (sq mi)</i> | |
|-----------------------|---------------------------|------------------------------|-------------------------|------------------|
| 110 | 25 | 16 | 1 | |
| <i>Volume (ac-ft)</i> | <i>Shoreline (miles)</i> | <i>Altitude (ft abv msl)</i> | <i>Latitude</i> | <i>Longitude</i> |
| 1800 | 2.63 | 188 | 47 14 52. | 122 57 52. |



Station Information

PHIMA1

| | | | |
|--|-------------|----------------------|------------------------|
| Primary Station | Station # 1 | latitude: 47 15 32.6 | longitude: 122 58 09.7 |
| Description: Deep site, approximately 500 feet east of a major point on the northern shore which bisects the lake into two distinct sides. | | | |

| | | | |
|---|-------------|-----------|------------|
| Secondary Station | Station # 2 | latitude: | longitude: |
| Description: Due south (about 1500 feet) from the northwesternmost tip of the lake. | | | |

Trophic State Assessment for 1998

PHILLIPS

Analyst: KIRK SMITH

| | |
|-----------------------------|----|
| TSI_Secchi: | 39 |
| TSI_Phos: | 34 |
| TSI_Chlor: | 38 |
| Narrative TSI: ^a | O |

Phillips Lake is an oligotrophic lake that is heavily used in the summer and is nearly built-out along the shoreline. Despite the heavy use, the water quality remains generally good, though there are periodic blue-green algal blooms. The mean phosphorus concentration was relatively low (7.6 ug/L). Non-toxic blooms of *Anabaena flos-aquae* have been identified in the past. Conductivity was extremely low. If more people become permanent residents there may be a higher likelihood of deteriorating water quality. The habitat survey shows substantial human influence along the shoreline. How human influence has impacted the lake is unclear, except that it may be attracting more Canada geese than desired. There have been reports of fish kills on Phillips Lake but there are no obvious water quality problems that may have contributed to those kills. There were no user surveys returned for the lake so we cannot determine whether there is a general perception of deteriorating water quality; however, some lake residents have formally expressed concern in the past by petitioning county commissioners to apply for a grant to study the lake and stop "the deteriorating condition." All beneficial uses appear to be supported. The lake is most likely phosphorus limited.

We recommend the phosphorus criterion for Phillips Lake be set at 10 ug/L, the action value in the water quality regulations for Puget Lowlands oligotrophic lakes.

^a E=eutrophic, ME=mesoeutrophic, M=mesotrophic, OM=oligomesotrophic, O=oligotrophic

Chemistry Data

PHILLIPS

| Date | Time | Strata | Tot P (ug/L) | Tot N (mg/L) | TN:TP | Chloro- phyll (ug/L) | Fecal Col. Bacteria (#/100mL) | Hardness (mg/L) | Calcium (ug/L) | Turbidity (NTU) |
|------------------|------|--------|-----------------|-----------------|-------|----------------------------|-------------------------------------|--------------------|-------------------|--------------------|
| Station 0 | | | | | | | | | | |
| 6/2/1998 | | L | | | | | 1 U | | | |
| | | L | | | | | 3 | | | |

| | | | | | | | | | |
|------------------|---|-------|------|----|-----|---|-----|------|-------|
| 8/17/1998 | L | | | | | 1 | | | |
| | L | | | | | 4 | | | |
| 9/17/1998 | L | | | | | 3 | | | |
| Station 1 | | | | | | | | | |
| 6/2/1998 | E | 6.6 | .237 | 36 | .86 | | 9.6 | 2260 | .9 |
| 7/25/1998 | E | 6.2 | .235 | 38 | 1.5 | | | | 1.4 J |
| 8/17/1998 | E | 9.3 J | .277 | 30 | 4.1 | | | | 1 |
| 9/17/1998 | E | 8.1 | .247 | 30 | 4.2 | | | | .9 |

Station 2

| | | | | | | | | | |
|-----------|---|--------|------|----|-----|--|--|--|--|
| 6/2/1998 | E | 11.2 J | .234 | 21 | .91 | | | | |
| 7/25/1998 | E | 7 | | | | | | | |
| 8/17/1998 | E | 7.9 | .263 | 33 | | | | | |

Strata: L=lake surface, E=epilimnion, H=hypolimnion; Qualifier: J=Estimate, U=Less than

Watershed Survey

PHILLIPS

Survey Date: 9/17/1998

Land Uses (1 = Primary, 2 = Secondary, etc.)

☐ Agriculture (commercial, not hobby)

☐ 1 Residential

☐ Commercial, Industrial

☐ 2 Park, forest or natural

☐ Major transportation

Impervious surfaces (Roads and parking area): No Curbs

Observations (check mark denotes presence)

BMP's ☐

No silt screens at construction sites.

Odors ☐

Cattle ☐ Ducks ☐ Geese ☐

Fertilizers and weed killers appear to be used in residential or agriculture area ☐

Buffer zones around streams and wetlands ☐

Buffer zones were rare around the lake. Clear cuts were well away from the water.

Irrigation ☐

Survey Id: 50

Habitat Survey Summary Report

PHILLIPS

Data are averages of 10 Stations Surveyed

Date of Visit: 7/21/1998

Vegetation Type (Avg. only of sites w/ vegetation present; 1=coniferous, 3=deciduous)

| | | | |
|-------------------|-----|-------------------------------------|----|
| Canopy Layer Avg: | 1.4 | Number of stations with canopy: | 10 |
| Understory Avg: | 2.7 | Number of stations with understory: | 10 |

Percent Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

| | | |
|---|--|-----|
| Canopy Layer: | trees > 0.3 m DBH | 2.7 |
| | trees < 0.3 m DBH | 0.7 |
| Understory: | woody shrubs saplings | 2.7 |
| | tall herbs, forbs grasses | 1.3 |
| Ground Cover: | woody shrubs seedlings | 2.1 |
| | herbs, forbs, grasses | 2.4 |
| | standing water or inundated veg | 0.1 |
| | barren or buildings | 1.1 |
| Substrate Type (within shoreline plot): | bedrock | 0.0 |
| | boulders | 0.0 |
| | cobble/gravel | 0.9 |
| | loose sand | 0.0 |
| | other fine soil/sediment | 0.0 |
| | vegetated | 2.1 |
| | other | 2.6 |
| Bank Features: | angle (O:<30; 1: 30-75; 2:nr vertical) | 1.0 |
| | vertical dist (M from wtrln to high wt): | 0.1 |
| | horiz. dist. (M from wtrln to high wt): | 0.1 |

Human Influence (0 = absent, 1 = adjacent to or behind plot, 2 = present within plot)

| | |
|---------------------------------|-----|
| buildings | 1.3 |
| commercial | 0.0 |
| park facilities | 0.0 |
| docks/boats | 2.0 |
| walls, dikes, or revetments | 1.6 |
| litter, trash dump, or landfill | 0.4 |
| roads or railroad | 0.0 |
| row crops | 0.0 |
| pasture or hayfield | 0.0 |
| orchard | 0.0 |
| lawn | 1.2 |
| other | 0.0 |

Physical Habitat Characteristics

station depth (at 10 m from shore) 2.1

Bottom Substrate (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

| | |
|--------------|-----|
| bedrock | 0.0 |
| boulders | 0.0 |
| cobble | 0.8 |
| gravel | 2.3 |
| sand | 2.3 |
| silt | 2.0 |
| woody debris | 1.6 |

Macrophyte Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

| | |
|------------------|-----|
| submergent | 1.5 |
| emergent | 0.1 |
| floating | 0.0 |
| total weed cover | 1.5 |

Do macrophytes extend lakeward (-1 = yes, 0 = no) -0.9

Fish Cover (0 = absent, 1 = Present but sparse, 2 = moderate to heavy)

| | |
|-------------------------------|-----|
| aquatic weeds | 1.5 |
| snags | 0.1 |
| brush or woody debris | 1.4 |
| inundated live trees | 0.0 |
| overhanging vegetation | 0.9 |
| rock ledges or sharp dropoffs | 0.1 |
| boulders | 0.0 |
| human structures | 1.7 |

Zooplankton Report

PHIMA1

Date 6/2/1998

Station: 1
Sample ID 16

Unknowns in Daphnia may not be Daphnia

Number of organisms measured: 154

| Group | Percent | Group | Percent |
|------------|---------|--------------------------|---------|
| Cladoceran | 55.2% | Small < 1mm | 81.8% |
| Copepod | 44.8% | Large >= 1mm | 18.2% |
| Other | | Ratio of large to Small: | 0.22 |
| | | Average size (mm): | 0.54 |

Date 8/17/1998

Station: 1
Sample ID 42

Site number one. Full of algae (? Or maybe some kind of tiny seed), made ID difficult. Also, many Cladoceran sheaths without bodes (weren't counted unless they were recognizable).

Number of organisms measured: 115

| Group | Percent | Group | Percent |
|------------|---------|--------------------------|---------|
| Cladoceran | 18.3% | Small < 1mm | 96.5% |
| Copepod | 81.7% | Large >= 1mm | 3.5% |
| Other | | Ratio of large to Small: | 0.04 |
| | | Average size (mm): | 0.32 |

Aquatic Plant Data

PHILLIPS

Sampler: Parsons, O'Neal

Survey Date: 7/20/1998

Max depth of growth (M): >6

Comments Sunny, light breeze. Shoreline is developed, many bulkheads but also many trees left standing, and many down and submersed. Aquatic plant community sparse and low growing. Much epiphytic algae on substrate and plants in NE end. Observed rough-skinned newts, bullfrog, many small fish. Conducted habitat survey for Kirk Smith.

SPECIES LIST

| Scientific Name | Common Name | Dist ^a | Comments |
|--|-------------------------|-------------------|----------------------------|
| <i>Dulichium arundinaceum</i> | Dulichium | 1 | |
| <i>Elodea canadensis</i> | common elodea | 2 | |
| <i>Iris pseudacorus</i> | yellow flag | 2 | |
| <i>Isoetes</i> sp. | quillwort | 3 | in shallow to deeper water |
| <i>Juncus</i> sp. or <i>Eleocharis</i> sp. | small grass-like plants | | |
| <i>Juncus</i> sp. | rush | 2 | emergent, few patches |
| <i>Najas flexilis</i> | common naiad | 1 | |
| <i>Nitella</i> sp. | stonewort | 2 | |
| <i>Potamogeton pusillus</i> | slender pondweed | 2 | |
| <i>Utricularia</i> sp. | bladderwort | 2 | in deep water, no flowers |

^a 0 - value not recorded (plant may not be submersed)

2 - few plants, but with a wide patchy distribution

4 - plants in nearly monospecific patches, dominant

1 - few plants in only 1 or a few locations

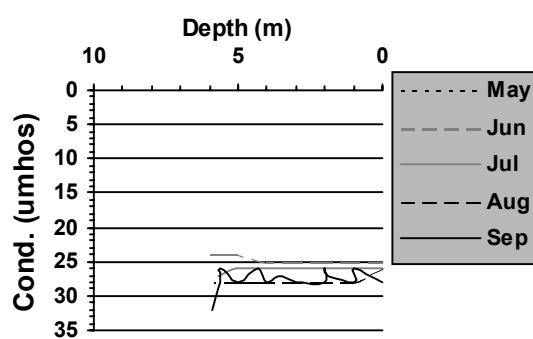
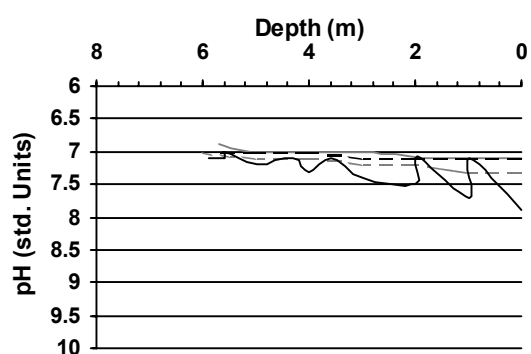
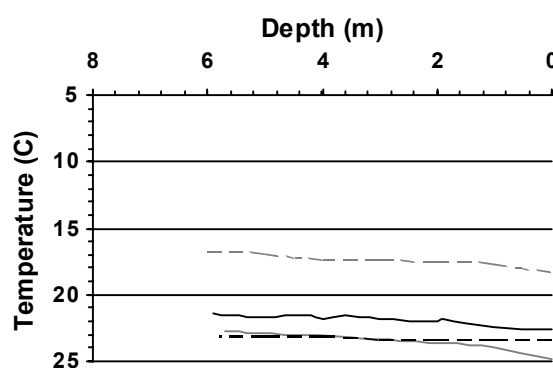
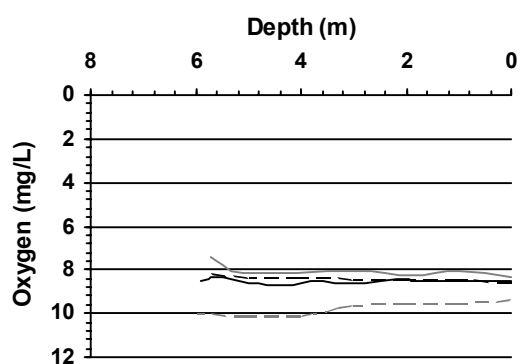
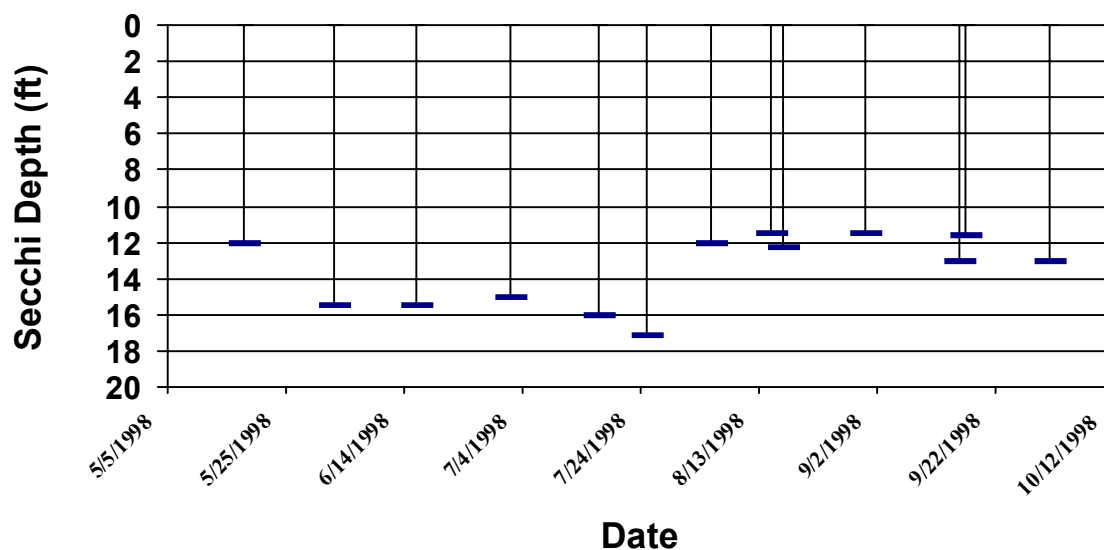
3 - plants in large patches, codominant with other plants

5 - thick growth covering substrate to exclusion of other species

Secchi Depth and Profile Graphics

Station: 1

PHIMA1



Secchi Data and Field Observations

PHILLIPS

| Date | Time | Temp- erature (F) | Secchi (ft) | Color (1-greens, 11-browns) | Bright- ness (pct) | Wind (1-none, 5-gusty) | Rainfall (0-none, 5-heavy) | Aesthetics (1-bad, 5- good) | Swimming (1-poor, 5- good) | Geese (#) | Waterfowl (besides geese #) | Boats- Fishing (#) | Boats- Skiing (#) |
|-----------|-----------------|-------------------------|----------------|--|--------------------------|------------------------------|----------------------------------|-----------------------------------|----------------------------------|--------------|-----------------------------------|--------------------------|-------------------------|
| Station 1 | | | | | | | | | | | | | |
| 5/18/1998 | | 15 | 12 | 2 | 50 | 2 | 2 | 3 | 3 | 2 | 6 | 2 | 0 |
| | Sampler: KEELEY | | | Remarks: STARTED TO RAIN. | | | | | | | | | |
| 6/2/1998 | | 17.7778 | 14.5 | 2 | 0 | | | | | 0 | 0 | 0 | 0 |
| | Sampler: SMITH | | | Remarks: | | | | | | | | | |
| 6/2/1998 | | 17.8 | 15.5 | 2 | 0 | 2 | 1 | 4 | 3 | | | 1 | 0 |
| | Sampler: KEELEY | | | Remarks: | | | | | | | | | |
| 6/16/1998 | | 17.8 | 15.5 | 2 | 50 | 2 | 1 | 3 | 3 | 0 | 5 | 2 | 0 |
| | Sampler: KEELEY | | | Remarks: | | | | | | | | | |
| 7/2/1998 | | 19.4 | 15 | 2 | 50 | | 2 | 4 | 4 | 7 | 6 | 1 | 1 |
| | Sampler: KEELEY | | | Remarks: | | | | | | | | | |
| 7/17/1998 | | 22.2 | 16 | 2 | 0 | 2 | 3 | 4 | 4 | 0 | 2 | 0 | 0 |
| | Sampler: KEELEY | | | Remarks: | | | | | | | | | |
| 7/25/1998 | | | 17.16 | 2 | 0 | | | 4 | 4 | 0 | 0 | 0 | 8 |
| | Sampler: SMITH | | | Remarks: LOTS OF BOATS. MANY SWIMMERS AT LAUNCH. | | | | | | | | | |
| 8/5/1998 | | 23.9 | 12 | 2 | 0 | 3 | 1 | | 3 | 3 | 2 | 0 | 0 |
| | Sampler: KEELEY | | | Remarks: | | | | | | | | | |
| 8/15/1998 | | 23.3 | 11.5 | 6 | 50 | 2 | 3 | 2 | 2 | 4 | 0 | 2 | 1 |
| | Sampler: KEELEY | | | Remarks: ALGAE BLOOM CONTINUES TO GET WORSE - WATER LOW. | | | | | | | | | |
| 8/17/1998 | | | 12.21 | 2 | 90 | | | 4 | 4 | 0 | 0 | 0 | 0 |
| | Sampler: SMITH | | | Remarks: CONSIDERABLE ALGAL BLOOM | | | | | | | | | |

| Date | Time | Temp- erature (F) | Secchi (ft) | Color (1-greens, 11-browns) | Bright- ness (pct) | Wind (1-none, 5-gusty) | Rainfall (0-none, 5-heavy) | Aesthetics (1-bad, 5- good) | Swimming (1-poor, 5- good) | Geese (#) | Waterfowl (besides geese #) | Boats- Fishing (#) | Boats- Skiing (#) |
|-----------|-----------------|-------------------------|----------------|---|--------------------------|------------------------------|----------------------------------|-----------------------------------|----------------------------------|--------------|-----------------------------------|--------------------------|-------------------------|
| 8/31/1998 | | 23.3 | 11.5 | 6 | 0 | 2 | 1 | 2 | 3 | 8 | 2 | 0 | 1 |
| | Sampler: KEELEY | | | Remarks: ALGAE BLOOM. | | | | | | | | | |
| 9/16/1998 | | 22.2 | 13 | 6 | 0 | 1 | 1 | 4 | 3 | | 5 | 0 | 1 |
| | Sampler: KEELEY | | | Remarks: NO ALGAE BLOOM. | | | | | | | | | |
| 9/17/1998 | | | 11.55 | | 50 | 1 | | 5 | 5 | 0 | 2 | 0 | 0 |
| | Sampler: SMITH | | | Remarks: FEC#1 TAKEN AT INLET ON 2ND BASIN. FEC #2 AT BOAT LAUNCH. The Conductivity result is qualified as an estimate due to postcalibration failing QA/QC requirements. | | | | | | | | | |
| 10/1/1998 | | 17.8 | 13 | 2 | 75 | 2 | 1 | 3 | 4 | 0 | 5 | 0 | 0 |
| | Sampler: KEELEY | | | Remarks: | | | | | | | | | |